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EOLOGICAL SURVEY OF CANADA,

ALFRED R. C. SELWYN, DIRECTOR.

REPORT

ON PARTS OF THE

UNTIES OF LEEDS, FRONTENAC AND LANARK

WITH NOTES

ON THE GOLD OF MARMORA,

BY

MR. HENRY G. VENNOR, F.G.S.

ADDRESSED TO

ALFRED R. C. SELWYN, ESQ., F.G.S.,

DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

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MONTREAL

(*Extracted from the Report of Progress for* 1872.)

Montreal:
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PROGRESS REPORT

OF

EXPLORATION AND SURVEYS

IN THE

COUNTIES OF LEEDS, FRONTENAC AND LANARK,

With Notes on the Gold of Marmora.

BY

MR. HENRY G. VENNOR, F.G.S.,

ADDRESSED TO

ALFRED R. C. SELWYN, ESQ., F.G.S.,

DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

SIR,—The following Report is a summary of the result of my geological researches in the Province of Ontario during the season of 1871.

As you directed, my investigations were continued through those parts of the counties of Frontenac, Leeds and Lanark which had not previously been explored. The rocks met with do not differ in their general characters from those described in the *Abstract of Report* on the geology of these counties which I had the honor to lay before you last spring, and in which they were divided into three groups, represented by the letters A, B, C, or the figures 1, 2, 3, corresponding with the divisions previously adopted for the rocks of the county of Hastings, described in my Report on that county. [Report of Progress, 1866–69.]

Frontenac, Leeds and Lanark.

In commencing the investigation last summer I made the crystalline limestones of division A a special study, and consequently chose that portion of the country where these were most largely represented, namely, the townships of Bedford, Loughboro', Olden and Oso, in the county of Frontenac; North and South Crosby, in the county of Leeds; and North Burgess, Bathurst and South Sherbrooke, in Lanark; and which is furthermore rendered important by the occurrence of deposits of magnetic iron ore, and of apatite, or phosphate of lime. During the course of my exploration all these deposits were examined and their respective stratigraphical positions determined as far as possible.

Crystalline limestones.

Magnetite and apatite.

MAP OF THE
TOWNSHIP OF MARMORA
shewing the position of the
MINES
NOW BEING WORKED FOR GOLD.
To accompany the Report of M.r H.G.Vennor for
1871

N
W
E
Mag. V.

Explanation

Granite

Gold Horizon

Bedded Lodes

The angles of dip are to the nearest degree of the lodes to the westward

Index

1. *Cook or Williams Mine.*
2. *Gillon Mine.*
3. *Severn Mine.*
4. *Gallinger Mine.*
5. *Hawkeye Co.e Mine.*
6. *Neille Mine.*
7. *Powells Mine.*

Deer River
Wells
Creek
Bedford
Bailee's P.O.
CROW LAKE
VILLAGE OF MARMORA
Crow River
From Stirling
Moira River
N. 10 W. Mag.

I II III IV V VI VII VIII IX X XI

32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Scale. 1 Mile to an Inch

The mapping of the crystalline limestones occupied a much greater part of the season than I had anticipated, for, owing to the incorrectness of the surveys through this section of country, we were obliged to keep up a continuous line of measurements throughout the whole area examined, and, for the same reason, found it necessary to re-survey all the roads through the townships of Bedford, Olden and Oso. The instrument used was the prismatic compass, with measurements by pacing, and occasional chaining.

Measurements.

Later in the season I again visited the townships of Madoc and Marmora, in the county of Hastings, and spent some time in a further examination of certain auriferous zones, the existence of which was first pointed out during the years 1866 and 1867, and on which are now situated several promising mines with stamp-mills. From the managers of these mines much assistance was received, and I would particularly acknowledge the kindness of Mr. W. J. Gatling, J. D. R. Williams, M.D., Mr. J. H. Dunstan, Mr. O'Neill and Mr. Jenkins. From Mr. Dunstan I have, further, received plans, drawn to scale, of a rotating cylinder furnace, recently patented by him in the United States; and from Mr Gatling a sketch-map, shewing the position of the shafts on his own and adjoining locations. The results of the foregoing explorations may be given under the following heads:

Madoc and Marmora.

Acknowledgement of assistance.

I. Notes on the Iron Ores occurring in the Counties of Frontenac, Leeds and Lanark, with assays.

II. Summary of the Phosphate of Lime or Apatite Deposits now being worked in North Burgess, Bedford and South Crosby.

III. The Geological Position of certain Ore-zones in the Township of Marmora, now being worked for Gold, with assays.

Iron Ores.

I. *Iron Ores.*—The iron locations examined were the Chaffey and Yankee or Mathews mines, in South Crosby; the Howse mine in Bedford; the Bygrove, Fournier and Christie's Lake mines in South Sherbrooke; the Foley mine in Bathurst; and the Dalhousie mine in Dalhousie township; all of which have already been alluded to in my *Abstract of Report* for the year 1870. Of these, the only ones worked to any extent during the year 1871, were the Chaffey, Yankee, and Dalhousie mines.

Chaffey Mine

The *Chaffey Iron Mine*, is situated on an island in Mud Lake on the Rideau, in South Crosby, and is about one mile distant from the village of Newboro'. Two excavations have been made, about thirty feet in depth, on a solid bed of magnetic iron ore, which strikes in a N. N. E. direction. During 1871, some twelve men were employed, and 3,500 tons of ore raised and sold. The ore is shipped to Cleveland, Ohio, via Kingston. At the mine it is worth $2.25 per ton, and delivered at Cleveland it brings from $6.00 to $6.50 per ton. The cost of carriage to Kingston—a distance of forty-four miles—is seventy-five cents per ton

Yankee or Mathews Mines.

The *Yankee*, or *Mathews Mine*, is situated about one hundred rods N. N. E. from the Chaffey mine, and on a continuation of the same bed. It is owned by S. H. Mathews Esq., and has been more or less worked since the year 1860. On this bed an excavation of irregular form has been made to the depth of about forty feet. During the year 1871, fifteen men were steadily employed, and upwards of 4,000 tons of ore mined and raised, 3,300 tons of which were sold, and shipped to Cleveland, Ohio, via Kingston. The price per ton at the mine, and delivered at Cleveland, is the same as that of the Chaffey mine. The total amount of ore sold and shipped to Cleveland from these two mines, for the years 1870 and 1871 combined, amounted to about 14,520 tons.

The demand for this quality of ore (*see analyses*) varies considerably at different periods, and, I understand, was much greater during the year 1869, than during 1870 and 1871.

Dalhousie Mine.

The *Dalhousie Iron Mine* is situated on the east half of the first lot, in the fourth concession of the township of Dalhousie, and is about twelve miles distant from the town of Perth. From the time of its being opened, in 1866, until September, 1871, this location was worked by Alex. Cowan, Esq., of Brockville, and partners; but subsequently they sub-leased it to Messrs. Hannah and Spearman, of Cleveland, Ohio, who at present work it. The mine is on a bed of red hematite averaging seven feet in thickness, striking N. E. by E., dipping south-eastward $< 45°$, and contained in a band of crystalline limestone. Six shafts have been sunk on the dip, as follows:—

Shafts.

No	1	shaft, 8 by 10 feet and timbered.....	68	feet	deep
"	2	"	49	"	"
"	3	"	25	"	"
"	4	"	20	"	"
"	5	"	45	"	"
"	6	"	29	"	"

Quantity, transportation and value of ore.

Mr. Jerald C. Brown, who has for some years managed the workings at this mine, informs me that the total length of *stopes* amounts to 408 feet; and that the quantity *stoped* from the opening of the mine, up to November, 1871, was 80,800 cubic feet. From this opening there has been extracted very close upon 10,000 tons of ore. About twenty-five men are employed, including one mining-captain and one blacksmith. The ore is drawn to Perth by waggons in summer, at the rate of $1.70 per ton, and in winter by sleighs, at $1.00 per ton of 2,240 lbs. From Perth it is carried by railroad to Brockville, and shipped thence to Cleveland, Ohio. The cost of the ore, laid down in Cleveland, is $5.00 per ton. The quantity raised from April 1st, 1871, to November 6th, 1871, was about 2,500 tons of 2,240 lbs.

Analysis of ore from the Dalhousie Mines.

Mr. Alexander Cowan informed me that it contained an average of 60 per cent of iron, according to numerous analyses made in the United

States. An analysis of it made in the Geological Survey laboratory by Mr. Gordon Broome gave as follows :—

Peroxyd of iron	82.250	= metallic iron 57.6
Insoluble residue	16.050	
Lime	trace	
Phosphorus	.026	
Water	.660	
	98.986	

Five further determinations recently made, have afforded an average of 56¾ per cent. of iron, shewing a close agreement with the result obtained by Mr. Broome.

Partial analyses by Dr. Harrington.

Samples of ore from the Chaffey, Yankee, Bygrove, Fournier and Foley, mines were, in accordance with your instructions, submitted to Dr. B. J. Harrington for analysis. The following figures shew his determination of the percentage of metallic iron in these ores, but more time will be required for their complete examination :—

Chaffey Mine	52.91	per cent.	metallic	iron.
Yankee Mine	52.09	"	"	"
Bygrove Mine	59.55	"	"	"
Fournier Mine	59.59	"	"	"
Foley Mine	58.69	"	"	"

The ores from the Chaffey, Yankee and Foley mines were all found to be titaniferous. That of the Chaffey mine is stated by Dr. Hunt to contain 9.80 per cent. of titanic acid (Report of Progress for 1866-69, page 257.)

Dr. Harrington finds 12.32 per cent. of titanic acid in the ore from the Yankee mine, and also a large amount of sulphur, which renders it altogether an inferior ore.

The ore from the Foley mine contains only 2.68 per cent. of titanic acid, which is not a sufficient amount to detract from its value.

The Chaffey and Yankee ores were also examined for phosphorus, but neither of them was found to contain a weighable amount.

The Bygrove and Fournier ores are free from titanium, and I think it extremely probable that they will be found to belong to beds somewhat higher in the series than the titaniferous ores.

Phosphate of lime.

II. *Phosphate of Lime.*—Last year I was enabled to determine the true position of the deposits of phosphate of lime, or apatite, in the townships of North Burgess, South Crosby and Bedford, and to establish the fact that, with very few exceptions, all of the workable deposits of this mineral occur in a certain belt or zone of pyroxenic and gneissic strata, and in the form of lenticular bedded masses, and irregular veins. This belt or zone, which was found to have a thickness of from 2,600 to 3,900 feet, lies in a long irregular trough, the axis of which may be described as running from the north-east to the south-west corner of North Burgess, thence south-westward through South Crosby, into the

Irregular trough.

south-east corner of Bedford township—between Devil and Opinicon Lakes—and still further in this direction, through the townships of Storrington and Loughboro.' All along this line, bed-deposits of phosphate of lime are of frequent occurrence. The width of the trough or basin seldom exceeds six or six and a-half miles, and is often narrowed to less than one-fourth the distance. In it the detailed sequence of the rocks has yet to be made out, but the available deposits of phosphate would appear to occur towards its outer rim, and within the 3,900 feet of pyroxenic and gneissic strata already alluded to.

Phosphate Locations.

The following list of *Phosphate Locations* comprises the most important of those examined by me last season, and in all of which work to a greater or less extent was being carried on :—

			WORKED OR OWNED BY
No.	1.	North Burgess—Concession VIII, Lot	1.—Ed. Schultze.
"	2.	" " " " "	2.—R. Matheson.
"	3.	" " " " "	3.—Ritchie & Jackson.
"	4.	" " " " "	4.—Watts Brothers.
"	5.	" " " " "	5.—R. Matheson.
"	6.	" " " VII, "	10.—Ed. Schultze.
"	7.	" " " " "	11 & 12.—A. Cowan.
"	8.	" " " VI, "	10.—E. Clark.
"	9.	" " " " "	13 (W.½).—Ed. Schultze.
"	10.	" " " " "	13 (E.½).—J. F. Baker.
"	11.	" " " " "	14, 15 & 16.—Morris & Griffin.
"	12.	" " " " "	18 & 19.—Matheson & Bell.
"	13.	" " " " "	21.—E. Clark.
"	14.	" " " V, "	16.—R. Leckie & Co.
"	15.	" " " " "	18 & 19.—Matheson & Bell.
"	16.	" " " IV, "	11.—E. Clark.
"	17.	" " " III, "	15 & 16.—Moro Philips.
"	18.	South Crosby, " VI, "	12.—Ed. Schultze.
"	19.	Bedford, " XVII, "	1.—A. Cowan.

Schultze's Locations in Burgess.

Schultze's Locations.—The apatite on these locations, Nos. 1, 6, 9, in North Burgess, was being worked by Mr. Edward Schultze for export to Germany. The most promising location is that on the first lot of the concession, where bedded deposits of a beautiful green crystalline apatite, entirely free from calcite, strike almost east and west with a slight underlie to the northward. On the tenth lot of the seventh concession Mr. Schultze owns one hundred and fifty acres. Here, a bed of apatite was uncovered for a distance of about four hundred feet, having an average width of from two to three feet. In this bed, there is an abundance of tolerably transparent mica, in large crystals, which may yet be of economic value. The apatite is of the red variety, and both it and the mica are further colored red by the decomposition of a bluish-grey hematite, which is more or less mixed with the former. From the fact that the mica constitutes the larger portion of this vein, and owing to its low position, and consequent difficulty of drainage, I hardly think it can be worked with profit. On the road

allowance between lots thirteen, of the sixth and seventh concessions, a shaft has been sunk to a depth of thirty feet on an irregular vein of red apatite, from which about forty tons of the mineral have been raised, averaging as high as 90 per cent. of phosphate of lime. A number of small openings have also been made by Mr. Schultze on the thirteenth lot in the sixth range, and a considerable quantity of apatite raised, of the quality known as "seconds." It occurred in layers or beds of from eight to twelve inches in thickness, and contained a large amount of black mica. Several bands of a pink calcite, highly charged with crystals of apatite, also occur on this lot. These crystals are very easily removed from the matrix, and although at present this form of deposit is looked upon by the miners as useless, there is little doubt that, at some future period, a simple process will be devised by means of which it will be treated with profit. Altogether Mr. Schultze has mined, raised and bought, in North Burgess, upwards of nine hundred and seventy-six tons (of 2,240 lbs.) of apatite, of which he has shipped six hundred to Germany.

Mica and pink calcite.

Matheson's Locations.

Matheson's Locations, Nos. 2 and 5 of the foregoing list, namely, lots two and five, in the eighth range of North Burgess, have been owned by Roderick Matheson, Esq., of Perth, for many years; but no work was done until the fall of the year 1870, from which period operations have been carried on, to a greater or less extent, up to the present. The rocks on the first of these lots are chiefly pyroxenic, with quartzose garnetiferous gneiss, and have a pretty uniform east and west strike, with uncertain dip. The apatite occurs in three bedded deposits, one of which has a breadth of nearly six feet. This has been opened upon for a distance of sixty feet on the strike, and to about fifteen feet in depth, and from it a large quantity of a beautiful green apatite has been raised and sold to Mr. Schultze for shipment to Germany. The deposits on the fifth lot are more irregular, and are much mixed with calcareous matter.

Ritchie and Jackson Location.

Ritchie & Jackson Location, No. 3, lot three in the eighth range of North Burgess, is at present being worked for Messrs. Ritchie and Jackson, of Belfast, Ireland, by Mr. W. Hargreaves of Perth. Here, the strata are very quartzose reddish gneiss and pyroxene rock, striking almost east and west, and dipping to the northward $< 45°$. A considerable amount of work has been done on two bedded deposits of apatite, eight to nine feet broad, which, with the enclosing strata, strike almost east and west, with underlie to the northward. This location has already been alluded to by Mr. Broome, as *McKinley's lot*, in his notes on the Phosphates of this section of country, (Report of Progress, 1870-1871, page 320.) It was very actively mined during the season of 1871, but I have been unable to obtain any return of the exact amount of mineral raised.

Watt Location.

Watt Location, No. 4, lot four, in the eighth concession, was leased for twelve months, by two brothers named Watt, from Mr. Flaherty, for the

sum of eighty dollars. Work was commenced in the autumn of 1870, and was continued during the ensuing winter, and during the summer of 1871. With very little outside help, these two young men succeeded in mining and raising upwards of two hundred and twenty-five tons of a very pure apatite, which they sold to Mr. Schultze for export to Germany, at the rate of $10.50 per ton, at the mine. The vein or bed from which this amount was raised is conformable with the adjacent strata, and runs in an almost east and west direction. Owing to the expiration of the lease, which ran out on the 24th September, 1871, and was not permitted to be renewed, the work was suspended. The vein, however, still holds forth good prospects.

Alex. Cowan's Locations in Burgess.

Alex. Cowan's Location, No. 7.—The lots worked by Alex. Cowan, Esq., and partners (*Brockville Chemical and Superphosphate Company*) are the eleventh and twelfth in the seventh concession, on the latter of which is situated the *Victoria Phosphate Mine*. This mine is nine miles distant from Perth, and about seven from the Rideau Canal. It is on a bed or vein, apparently conformable to the immediately surrounding pyroxenic and gneissic strata, striking in a N. N. E. direction, and having an average width of about three feet. This has been worked pretty steadily since the month of April, 1870. Two shafts have been sunk, one to the depth of about fifty-six feet, and another to about forty-eight feet, besides numerous other minor openings of varied extent. The total area worked over is about three hundred acres. From the main deposit there has been raised from April, 1870, up to April, 1871, upwards of eight hundred tons of apatite, averaging about 85 per cent. Work was also actively carried on here during the summer of 1871, and a large additional amount raised, the exact return of which I have not yet received. The produce of this mine is shipped to the Brockville Superphosphate Works, near the town of Brockville, whence it is exported, as superphosphate, both to the United States and Europe.

Quantity raised

J. F. Baker's Location.

J. F. Baker's Location, No. 10, (*Cambria Phosphate Mine*).—This location is on the east half of the thirteenth lot in the sixth range of North Burgess. It is worked by Mr. J. F. Baker, for an English company, which commenced operations during the month of September, 1871. A number of bedded deposits occur here, varying in width from a few inches to seven feet. Seven of these have been opened, and, although the lowest point reached last fall was only fifteen feet, Mr. Baker had succeeded in raising about two hundred tons of first quality phosphate, — the result of about three months' working. The mineral here varies in character from green, coarsely crystalline and massive, to white, finely granular and saccharoidal. This would appear to be a very promising locality. It is only one mile from the Rideau, to which the apatite can be drawn by winter road, for fifty cents a ton. The general character of these deposits has yet to be investigated.

E. Clark's Locations.

E. Clark's Locations, Nos. 8, 13 and 16.—The eleventh lot of the fourth, and the tenth and twenty-first lots of the sixth concession in North Burgess are three lots out of a number purchased by Mr. E. Clark, of Sherbrooke, from the Bank of Upper Canada. On these Mr. Clark, during the summer of 1871, commenced and personally superintended a series of experimental workings, and was fortunate enough to discover a number of most valuable deposits of apatite, especially on lots ten and twenty in the sixth concession. Those on the tenth lot were clearly seen to occur as parallel bedded deposits, alternating with bands of reddish gneiss and pyroxene strata. Towards the rear part of the lot the general strike is N.N.E., and here some of the apatite beds are a good deal mixed with a fine bluish-grey hematite, in much the same manner as the deposit already noted on Mr. Schultze's property, on the tenth lot in the seventh concession. Towards the front of this lot, and approaching Long Lake, the strike of the rocks changes to almost east and west, and here further deposits of apatite were observed, also bearing in an east and west direction. Although the work on this lot was, as I have before stated, merely of an exploratory or experimental character, a very considerable amount of "first quality" red and green apatite was extracted, and piled on the ground for future disposal. There appear to me to be four distinct main parallel beds, besides a multitude of minor ones, some of the more important being of at least five feet in thickness. The work on the twenty-first lot, in the same concession, was also personally superintended by Mr. Clark, but was not commenced until late in the season, and after stormy and cold weather had set in. Here, however, a few days' work uncovered some very promising deposits, from some of which large masses of nearly pure apatite were extracted. At the time of my visit to this lot sufficient work had not been done to permit of my properly understanding the true nature of the deposits, but, from the openings which had been made, they appeared to me to consist of large bedded masses, striking and dipping with the enclosing rocks. Mr. Clark is at present, I understand, in treaty with an English company, which proposed purchasing these lots, with a view to their further development.

Apatite associated with hematite.

Four distinct beds.

Matheson and Bell's Locations.

Matheson and Bell's Locations, Nos. 12 and 15.—The lots on which Messrs. Matheson and Bell were at work during the year 1870 have been mentioned in the notes by Mr. Gordon Broome, already cited. During 1871, other deposits of apatite were opened up by them on the eighteenth and nineteeth lots, in the sixth, and on similarly numbered lots in the fifth concession of North Burgess. On the first-mentioned lot, a great number of openings have been made on a series of parallel and bedded deposits of this mineral, which strike, with the enclosing strata, in an almost east and west direction, along the point of land which here juts out into Black or Salmon Lake. Much of the apatite is very largely mixed with a pink or

reddish calcite which holds aggregations of large-sized crystals of a greyish pyroxene. A considerable quantity both of "firsts" and "seconds," has been raised on these lots, but I am not aware that any was shipped during last summer. Much of the work done has been, up to the present time, of an experimental character, but there can be little doubt that a large amount of marketable phosphate will yet be found here.

Pink calcite with greyish pyroxene.

Morris and Griffin's Location, No. 11.—During the year 1870, Messrs. Morris and Griffin, of Wolverhampton, England, manufacturers of artificial manures, purchased seven hundred and fifty acres of land in North Burgess; namely, the fourteenth, fifteenth and sixteenth lots in the sixth and seventh concessions. Early in the season of 1871, Mr. Wm. Davis, agent for these gentlemen, commenced a series of explorations on these lots, and succeeded in discovering on those in the sixth concession some important indications of phosphate of lime. These occurred towards the rear ends of lots fourteen and fifteen, and close to the line between concessions six and seven. The openings made during the season were chiefly shallow surface pits, many of which, however, gave considerable encouragement for the further prosecution of the work. The lots in the seventh concession have not, and are not likely to yield anything of importance, as they are chiefly occupied by the horizontal sandstones of the Potsdam formation. Messrs. Morris and Griffin, I am informed, will commence systematic work on the most promising portions of their lots during the approaching summer.

Morris and Griffin's Locations.

Potsdam sandstones.

The remaining locations in North Burgess noted in the foregoing list, namely those of R. Leckie and Company, of Montreal (No. 14), and Mr. Philips of Philadelphia (No. 17), were not worked during the past summer, although both of them still hold out good encouragement for further development. From No. 14 upwards of sixty tons of phosphate have been extracted, and still remain on the ground at the mine. From No. 17 about one hundred tons have been shipped by Mr. Philips to the United States, via the Rideau Canal. No. 14 location, R. Leckie and Company, is, I believe, now in the market, but the price placed upon it is rather beyond the means of present purchasers of phosphate lands.

Locations 14 and 17.

Schultze's Location, No. 18.—On this location, in South Crosby, Mr. E. Schultze has made a few experimental openings on the twelfth lot of the sixth concession, near Sand Lake. He has discovered a very fair show of apatite, and already raised about fifteen tons of first quality. Very little prospecting has yet been done in this township, but it is altogether likely that many large deposits of apatite will yet be discovered on the course of the pyroxenic and gneissic belt already alluded to, where it is not concealed by the sandstones of the unconformable Potsdam formation.

Schultze's Location in South Crosby

Sand Lake is a part of the Rideau waters, and from it the phosphate may be shipped by barges to Kingston, or to any other port on the St. Lawrence.

Cowan's Location in Bedford.

Cowan's Location, No. 19.—This location in Bedford was first worked in the fall of 1870, and is mentioned in my Report for that year (Report of Progress 1870–71, page 315); since that time there has been more or less work done. On the first lot in the seventeenth concession Mr. Alexander Cowan has opened some exceedingly promising bedded deposits of from two to four feet thick. The strata—consisting mainly of heavy, dark, hornblendic rocks, entirely free from limestone—lie in an almost horizontal position, the incline being to the north-westward. The phosphate is of the red and green varieties, but principally the latter, and is of a very beautiful crystalline character. At the time of my visit about three tons a day were being extracted, and two hundred and thirty tons were piled on the wharf at Opinicon Lake, about half a mile distant from the mine. Altogether there had been mined and raised from this location, up to the fall of 1871, some five hundred and forty-nine tons of first quality phosphate. Mr. Oatey, the superintendent, has recently informed me that there is now visible a thickness of about twenty feet of phosphate, with but very little rock intervening. The beds, however, are very variable in their dimensions, often changing within a few yards from five or six feet in thickness to as many inches.

Gold in Marmora.

III. *Gold in Marmora.*—The geology of the townships of Madoc and Marmora has already been given in considerable detail in the *Report of Progress* for 1866–69, pages 144 and following. Much additional information, however, and many important facts have been gathered since the publication of that Report, and more particularly during the past summer, The portion of these townships to which I would at present refer, and in which the only mines now being worked for *gold* are situated, is that immediately surrounding the granite area known as the Huckleberry Rocks. These rocks have been shewn (Report of Progress already cited, page 146) to occupy a very large part of the south-western quarter of Madoc, and the south-eastern quarter of Marmora, extending north-westward on the boundary line between these townships as far as the middle of the eighteenth lot, with a breadth of about four miles, the River Moira in Marmora forming their western limit.

The Huckleberry Rocks.

Surrounding the granite mass, and apparently conforming to its general outline, occurs a series of stratified deposits, consisting of greyish talcoid mica-slates, opaque white and reddish felsites with epidote, greenstones or diorites, ferruginous dolomites, crystalline limestones and rusty quartzites, towards the base of which occur deposits of magnetic iron ore, and small quantities of red hematite. In the talcoid slates are found large bedded quartz veins, holding sulphurets of iron and copper, and native gold. All these deposits appear to me properly to belong to DIVISION B., (Report of Progress for 1866–69, page 145, and Report of Progress for 1870-71, page 310.)

Quartz veins, holding sulphurets of iron and copper, and native gold.

In the map accompanying the present Report, I have endeavoured to represent the western outline of the granite mass in Marmora, and to show the position of the various openings made for gold in its proximity. It will at once be observed that were a line drawn, connecting these openings, it would represent a zone conforming to the general contour of the granite, and be at a nearly uniform distance from it. The probability of the existence of such an auriferous zone or belt was first pointed out by me in the Report first before cited, which I had the honour to submit to Sir W. E. Logan, early during the year 1867, before openings of any consequence had been made in Marmora. In this Report, after giving a detailed description of the course of the iron-bearing rocks through these townships, pages 150 and 151, I further stated on page 169, that the various localities in which gold had been found appeared to have a nearly uniform relation to the ferriferous belt, "a close proximity to the summit of which" would "in my opinion afford the most probable positions for the discovery of gold." This view has been most satisfactorily borne out by the openings since made in Marmora, all of which, as represented in the accompanying map, occur close to the valley of the River Moira, "the course of which might almost be said to denote its further run through this township." (Same Report, p. 151.)

Map.

Uniform relation between the gold and the iron-bearing zone.

The age of the granite, on which these gold-bearing rocks rest, is not yet satisfactorily determined. That it is of more ancient date than the latter is I think clearly shown by the manner in which they repose upon its flanks, and conform to its general outline. My own conviction is, that this, and other like masses of granite met with throughout the Hastings district, represent eruptions which probably took place towards the close of the Laurentian period, or at some time prior to the deposition of the greenstones, schists, dolomites and limestones, of DIVISIONS B. and C. For wherever these higher rocks are wanting, we find the Laurentian gneisses, quartzites, and limestones, where in proximity to, or even at a considerable distance from the granites, cut up by a perfect net-work of veins, which differ from the parent mass only in being of finer texture. This is the case in a very marked manner in the township of Burleigh, Peterboro' county, about twelve miles west of Marmora, where the Laurentian gneisses and limestones are seen intersected in every direction by veins of a pale red syenite, often containing tourmaline, which apparently emanate from the red granite area, known as the Pine Plains, in the township of Methuen; while immediately adjoining these Plains on the east side, in Lake, rocks of the same age as those of Marmora remain unaffected.

Age of the granite.

Syenite veins.]

The general characters of the strata surrounding the Huckleberry rocks in Madoc and Marmora have been already given. In them gold occurs as follows:—

Mode of occurrence of the gold in Madoc and Marmora.

1.—In bedded metalliferous lodes.
2.—In slate bands, impregnated with sulphurets
3.—In nests, or bunches with quartz and sulphurets in dolomite.
4.—In cross or fissure veins (of minor importance.)

1. *Bedded Metalliferous Lodes.*—As in Nova Scotia, so in the township of Marmora, the most productive quartz lodes are conformable with the stratification. They consist chiefly of translucent vitreous quartz, coarsely crystalline masses of mispickel with black mica, sulphurets of iron and copper, more rarely of zinc, and in one instance oxide of tin. The oxide of tin occurred in a specimen submitted to Prof. James Bell, of Belleville, for examination, who, in a letter to me, dated February 6th, 1871, stated that on one occasion he had found a few small crystals of tin ore, adhering to a specimen of iron ore containing arsenic, and associated with quartz and mica. Unfortunately, the locality from which this specimen was obtained was rather doubtful, but it was among a number sent from Madoc and Marmora. The gold occurs visibly both in the quartz and the mispickel. In the former it is in very minute particles, but in the latter often in irregular lumps of considerable size. The foot-wall is generally the grey talcoid or unctuous mica-slate, and the hanging-wall either a greenstone, or a feldspathic band with disseminated pyrites. In some instances the mica-slate is wanting, and then both walls of the vein are of a dark grey hornblendic gneiss, which is slightly calcareous, as at the Williams mine in Marmora.

Tin ore.

Character of the bedded lodes.

These bedded lodes have been traced continuously all along the Marmora side of the Huckleberry rocks, and are represented in the accompanying map by disconnected black lines. They are not of uniform thickness, but assume more the character of a series of lenticular patches, which in some instances have an extreme thickness of from ten to fifteen feet.

2. *Slates impregnated with Sulphurets.*—These are next in importance to the quartz lodes, of which they generally form the foot-wall, and in some instances both walls. They resemble somewhat the gold-bearing slates of Nova Scotia, and contain interposed layers of vitreous quartz, holding mispickel, sulphurets of iron, and free gold. Sometimes instead of the sulphurets, layers of magnetic oxide of iron occur, to such an extent as to form deposits of economic importance, in which cases the gold and iron are intimately associated in the same horizon, specimens having been obtained in more than one locality, where small grains of the precious metal were seen to be embedded in the iron. In places, on the run of the unctuous slates occur deposits of steatite or soapstone, a fact which has already been pointed out in my Report for 1870.

Soapstone.

3. *In nests with Quartz in Dolomite.*—This is an exceptional form in which the gold occurs in some few localities, and generally of too irregular a description to be worked with profit. Examples of this mode of occurrence

Limestones and Dolomites.

are the Richardson and Empire mines in Madoc, in both of which instances, although gold was found in comparatively large quantities at the outset —as shown in the Report of Progress for 1866–1869—it was subsequently found to be of too irregular and uncertain occurrence to be mined with profit.

Limestones and dolomites.

It is only towards the summit of the auriferous horizon that limestones and cavernous dolomites make their appearance. Through Marmora, numerous small openings made on the course of the latter have yielded small amounts of gold, more interesting, however, in a geological point of view, than profitable to the miner.

4. *Cross or fissure-veins.*—A few of these cross or fissure-veins, or, as the miners term them, *spurs* and *leaders*, are met with, crossing from one bedded lode to another, and cutting the intervening strata at various angles. In them gold occurs both in the quartz and the sulphurets, but they are generally of so limited an extent that they rather serve as guides to the discovery of the main veins than as workable deposits themselves.

Ore district in the Schwarzenberg, compared with those of Madoc and Marmora.

In *Von Cotta's Treatise on Ore-Deposits*, page 120, he describes a certain ore-district in the Schwarzenberg, Germany, which, in a very marked manner, resembles those of Madoc and Marmora. The Schwarzenberg district consists, according to him, of a series of crystalline mica-schists, through which protrude several masses of granite, "the most important of which is the Rackelmann.....The crystalline schists all have a gentle slope away from this granite dome, so that their lines of strike surround it concentrically. The ore-deposits of this district occur as :

1. Bedded veins, combined with greenstone, and containing many different ores.
2. Hematite lodes.

The bedded veins surround the granite of the Rackelmann also concentrically, as they follow the schistose structure of the mica schist, not as a continuous circle, but as small fragments of rings. These often attain a great breadth in the central portion of their extent; and from this cause approach, in horizontal section, an irregular lenticular form. They are always so firmly combined with the greenstones, that they are only with difficulty separated from them, and are frequently accompanied by granular limestone, or dolomite." This description may be said to apply, word for word, to the Marmora ore-district, which, however, contains in addition deposits of magnetic iron.

Gold-workings in Marmora and Madoc.

During my exploration in 1871, the workings for gold were confined to the Marmora side of the Huckleberry rocks. The feverish excitement which pervaded this district in 1868, has entirely subsided, and is now replaced by steady working in some three or four localities. In Madoc, though similar deposits to those of Marmora are known to exist (Report of Progress for 1866–69), they are unfortunately so much concealed by the

horizontal limestones of the Trenton group, which overlie them unconformably, as to render it impossible to trace out their distribution, or to mine them profitably. A glance at the map accompanying the Report on the county of Hastings (Report of Progress for 1866–1869, page 143) where these higher limestones are represented by the dark blue colour, will at once make this fact evident.

The following is a list of the lots in Marmora, on which work is now, or has recently been in progress, and where openings of some importance have been made; commencing with the most southerly:—

1. The Cooke, or Williams Mine.....	Lot	7	Con.	IX	Marmora.
2. The Gillen Mine.....	"	6	"	VIII	"
3. The Severn Mine.....	"	8	"	VIII & IX	"
4. The Gatling Mine.....	"	9	"	"	"
5. The Hawk-eye Mine.....	"	10	"	"	"
6. The Neill Mine.....	"	14	"	X	"
7. The Powell Mine.....	"	17	"	XI	"

Cooke, or Williams Mine.

The *Cooke, or Williams Mine*, is situated on the south-west corner of the seventh lot in the ninth concession of Marmora, and was mentioned in the list of localities in which the presence of gold had been verified, in the *Report of Progress* for 1866–69, page 168, and again on page 171. The mine is owned by Cooke Brothers, of Toronto, and is superintended by J. D. K. Williams, M.D. It is on a vein of quartz and mispickel, with black mica and suphurets of iron and copper, the whole having an average width of from four to five feet, striking about N. 17° W., and dipping to the westward $>45°$. The immediately adjoining rock is a heavy, dark grey, hornblendic gneiss, and the total absence here of the unctuous slate is a noteworthy fact. On this vein, a shaft, six feet by ten, has been sunk to a depth of seventy feet, and levels driven on either side to an extent, in all, of ninety feet. A large quantity of ore, chiefly quartz and mispickel, has been raised; but the greater part of it still lies on the ground awaiting treatment. Up to the winter of 1872, the work carried on here, apart from the mining and raising of the ore, has been chiefly experimental, and although the results arrived at by Dr. Williams, from time to time, exceeded his expectations, he still found by further treatment of the tailings resulting from his mill process, that a large percentage of the precious metal was being lost. The first mill used was one that had formely been worked by Mr. Berry, in the township of Barrie, near the Addington Road, in Frontenac County, but was subsequently sold and removed to Dr. Williams' location. It was of the ordinary form, consisting of one battery with five circular rotating stamp-heads, worked by an engine of fifteen horse-power. I saw it in operation during the month of January, 1870, when some two hundred and fifty tons of ore were put through. The shaft then was sixty feet in depth, and numerous beautiful specimens were shown to me, which had been recently

Character of the vein.

Loss of gold.

extracted, composed of quartz and mispickel, with visible gold. The ore was being calcined in an open kiln, prior to its entering the mill. The kiln, when filled, held forty tons of ore, which it took four days to calcine properly. Before its erection, the ore had been taken to the mill without previous calcination, and a cleaning up, shortly before my arrival, after the treatment of four and three-quarter tons, had resulted in the yield of a little over $10.00 to the ton. This mill remained in use during the ensuing summer of 1870, with variable results, all the ore being first calcined in the open kiln. During the month of September, of the same year, another cleaning up, after the treatment of one hundred and seven tons and three-quarters of ore—quartz and mispickel—yielded $1,035.00. The depth at this time was sixty-six feet, only six feet deeper than during my visit in the previous January, but a considerable quantity of ore had been extracted by *drifting*. Still later, in February, 1871, this lode continued to be worked with profitable results. At this time Dr. Williams made arrangements for the introduction of J. W. Forbes' *Automatic Steam Quartz Crusher*, in place of the ordinary five-stamp mill. This invention was warranted, *with two stamps, and a five horse-power engine, to do the work of an ordinary mill of twenty stamps, with twenty-five horse-power engine.* The patentees further offered to put it up on trial, free of cost, and to remove it if not approved of. It was accordingly put into operation during the month of March, 1871, but, after a very short trial, was abandoned in the ensuing month of April as quite unsuitable, and the old stamps replaced. The open kiln was also set aside, and preparations made for erecting a suitable reverberatory furnace for roasting the ore.

Forbes' Automatic Steam Quartz Crusher.

During the fall of 1871 and commencement of 1872, Dr. Williams was engaged in enlarging and improving his mill, by the addition of fifteen stamps, making in all twenty stamp-heads, and in the erection of a revolving Cylinder-furnace, recently patented by Mr. John H. Dunstan. These changes were completed early in the month of February, 1872, at which time I again visited the mine and collected some further information. About thirty-five men were being employed in the mill and shaft. The mill is erected a short distance to the south-west of the shaft, and close to the east bank of the Moira River, on the sixth lot of the eighth range. The stamps are all of the circular rotating description, arranged in four batteries of five each, and are similar to those in use in many parts of Nova Scotia. They are worked by an engine of fifty horse-power, which is also used to turn the revolving cylinder of the roasting furnace, erected in the same building and close to the batteries. The quartz is crushed in the batteries with water, and the pulverized ore passed over a set of blanket troughs previous to its treatment in amalgamating pans of the Wheeler pattern. The other internal arrangements of this mill are much the same as in stamp-

Dunstan's Revolving cylinder-furnace.

Treatment of the quartz.

mills used in Nova Scotia and elsewhere, and being well known need not be further described.

In the Dunstan Cylinder-furnace no new principle is claimed by the patentee, but merely a simpler combination of those already well known, and applied in the *Stetefeldt*, *Keith*, *Whelpley & Storer*, and *Brückner* furnaces, to which he has added some details of his own invention. The accompanying plan, Fig. 1, drawn to the scale of four feet to one inch, will give a good general idea of the furnace :—

Description of the Dunstan Cylinder-furnace.

In Fig 1, A is a brick fire-box ; B, a revolving sheet-iron cylinder, inclined from the fire-place, and in which are built six shelves of fire-brick, the whole interior being also lined with the same material ; C, a chamber in which is a water trough K, with a running stream of water ; D, a dust chamber ; E, an arsenic condensing chamber ; F, a sheet-iron drying tray or pan, furnished with a mechanical rake ; G, a hopper into which the ore is raked, and from which it passes, through the tube J, into the cylinder, being at the same time scattered by a fan blast, from another tube enclosing J ; H H H are friction rollers on which the cylinder B revolves ; I, the flue.

The pulverized ore, coming from the batteries wet, is spread out in the drying pan F, being at the same time slowly raked towards the hopper G, from which it passes into the cylinder. The cylinder turns at the rate of five revolutions per minute, or faster if necessary, and in it the ore is tossed from shelf to shelf through the flame, which passes through the centre, and, after about twenty revolutions, reaches the further extremity, and falls into chamber C, and the tank K. In this tank or trough, Mr. Dunstan contends that the pulverized and roasted ore is yet more finely divided, and is also freed from a coating which appears to render it unfit for amalgamation. In any case, the tank, if of no other use, saves a considerable amount of manual labour, as the water passing through it carries the ore to the amalgamating pans. Instead of chambers C, D and E, Mr. Dunstan has devised another plan, Fig. 2, dispensing with the tank, and in which the pulverized mineral passes at once into a chamber, where it is treated as in an ordinary reverberatory furnace, and which has also combined with it a chamber E, for condensing the arsenic.

Cost.

The cost of erecting this furnace is nearly as follows :

Iron-work	[illegible]
Fire-brick (6,000).....	60.00
Sand and lime	[illegible]
Labor.....	90.00
Total.....	$375.00

All the iron-work is protected from fire and fumes by fire-brick. Respecting the working of this furnace, but little can be said at present, it having been so short a time in operation. That it has defects, and that

SCALE 4 FEET TO 1 INCH.

Fig. 1.

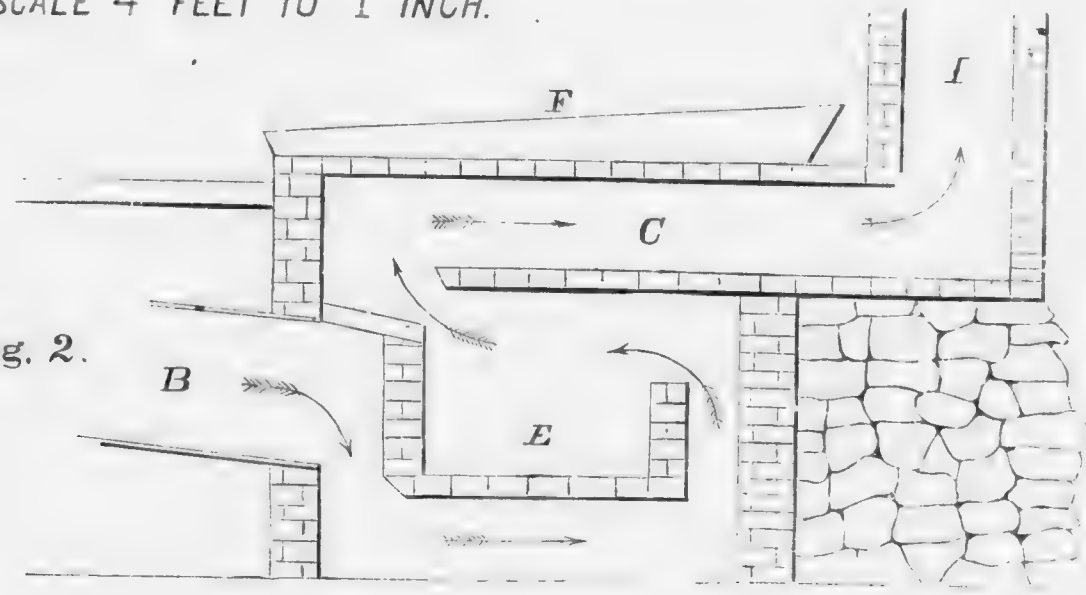
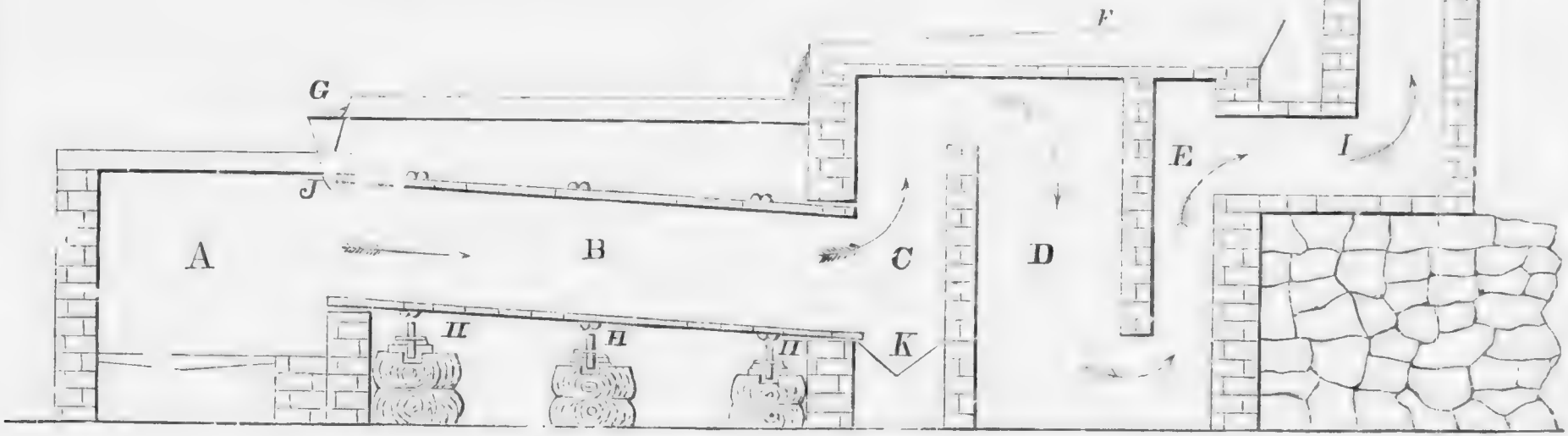


Fig. 2.



it will yet require some very important alterations, seems to me evident; but the fact that it has already effected a considerable saving in gold, indicates the trial to be in the right direction.

At the time of my last visit to the 'Williams' mill, the furnace had hardly been fairly put into operation, but after some weeks working, Mr. Dunstan furnished me with the following information. The furnace burns one cord of soft wood in twenty to[illegible] hours, and the whole of its machinery and connections can be wo[illegible] about two and a-half horse-power. From partially concentrated tailings—say 60 per cent. of sulphurets—which had previously yielded from $9.00 to $11.00 per ton, a trifle over $18.00 per ton was extracted, after treatment in this furnace. The average yield of the ore as it comes from the mine would appear to be from $17.00 to $20.00 per ton.

Oxland's furnace.

A furnace which would, perhaps, much better suit the ores of Marmora is one known as '*Oxland's furnace*,' in very general use both in Europe and America. In this, the revolving cylinder inclines in the opposite direction to '*Dunstan's*,' namely, towards the fire place, instead of from it, the ore being introduced at the end farthest from the fire, and brought from lesser to greater heat; whereas, in the furnace first described, the ore being introduced into the flame is subjected to an extreme heat at the outset, and gradually cools on its passage through the cylinder.

The Gillen Mine.

2. The *Gillen Mine* is situated in the north-eastern corner of the sixth lot, in the eighth range, and about twenty-four chains south-west of the Williams shaft. The lode is a parallel but somewhat higher one in the series than the one last described, being separated from it by about seven hundred feet of a grey hornblendic rock, surmounted by a band of greenish-gray talcoid slate. It is clearly an interposed or intercalated lode, striking with the associated rocks to the west of north (N. 17°—20° W.) and dipping to the westward 30°—35°, and is from four to six feet wide. The foot-wall is the talcoid slate with interposed layers of quartz and sulphurets, and the body of the vein is chiefly quartz, carrying about 10 per cent. of mispickel, with sulphurets and free gold. The rocks immediately overlying this, are greenstone and opaque white felsites, above which occur dolomite and limestone.

During the year 1870, a mill of five stamps, worked by water-power, which had formerly been in use at Eldorado in Madoc, was used by Mr. William Gilbert in connection with this mine. Two small openings were at this time made in the vein, and some ore extracted, of which about two hundred tons were put through the mill, and returned from $5.00 to $9.00 per ton. Mr. Dunstan, however, succeeded afterwards in obtaining upwards of $20.00 per ton, from samples of concentrated ore, which had already been twice worked through this mill. Shortly after, owing to the breaking down of the water-dam, work was suspended on this location.

In 1871, Mr. Andrew White, contracted to raise one hundred tons of ore from the Gillen lode, which was to be tested in the mill at the Williams mine. An opening was made on the course of the vein, of about fifty feet in length, five or six feet in width, and of irregular depth, the lowest point reached being about twenty feet, and the cost of mining and raising the ore only $1.50 per ton. The mill return on the one hundred tons averaged $6.00 per ton, which, there is very little doubt, was considerably less than the actual contents of the ore. The property is now in the possession of W. J. Gatling and partners. Numerous laboratory assays have been made of the ore from this mine, and are reported to have shown a large yield in both gold and silver. The assays given below are taken from a Report on this location recently made by Professor E. J. Chapman, of University College Toronto.

Assays by Professor Chapman.

Professor Chapman says: "In order to obtain a fair average sample of the vein, as at present opened, I had two blasts put in at a distance of about twelve feet apart, and about six feet below the surface of the ground. From the fragments thrown out by these blasts, I broke off between 30 and 40 lbs. of ore, taking a piece or two from each fragment.

"A single trial-assay made from a selected piece of the pyrites, free or nearly so from quartz, (but in which no visible gold could be detected by the magnifying glass), gave me, per ton of 2000 lbs., the extraordinary yield of 8 oz. 3 dwts., equivalent to $168 per ton.

"This, however, can scarcely be regarded as a fair criterion of the yield of the vein, and it is only mentioned here to show the actual amount carried by some portions of the ore. But the following results were obtained from portions broken fairly from every piece of the ore thrown out by the two shots or blasts, (from all, at least, that could be collected.) Several fragments were thrown to a great distance, and could not be found.

"ASSAY 1.—(Portions of powdered ore from both shots.)

Gold.....6 oz., 10 dwts., 16 grs.=$134 per ton of 2000 lbs. of ore

Silver.....3 dwts., 7 grains

ASSAY 2.—(Portions of powdered ore from both shots.)

Gold.....6 oz., 5 dwts., 8 grs.=$132.56 per ton of 2000 lbs. of ore

Silver.....[illegible]

Average yield of gold per ton of ore=$133.28.

"These results, obtained by the most scrupulously fair treatment of the ore, are decisive as to the general richness of the vein. If at other parts at present unopened, the yield sink to even a third or fourth of the above, the ore would still be of more than average quality."

General richness of the vein.

During the summer of 1867, while engaged in mapping the distribution of these gold bearing rocks in Marmora, I succeeded in tracing the Gillen vein through the seventh, eighth, ninth and tenth lots, in the eighth con-

cession, its course being plainly indicated by broken fragments of rusty surface-quartz, holding mispickel. Through lots nine and ten the course changed from N, 17° W. to almost north and south magnetic, and the vein disappeared beneath an extensive swamp in the south-west corner of lot eleven, in the ninth concession, beyond which all trace of it was lost for some distance, owing to low swampy ground, which continues northward through lots eleven, twelve and thirteen of the same concession. On reaching, however, the fourteenth lot, in the tenth concession, I again found loose fragments of quartz and mispickel, and shortly afterwards, on the same lot noted a well defined vein, striking N. N. E., doubtless the continuation of that already traced up to the swamp commencing on the eleventh lot of the ninth concession.

The Severn Mine.

(3). The *Severn Mine* is situated half way up the line between the eighth and ninth concessions, about the eighth lot, but no work has been in progress recently. At the time of my visit, the shaft, which has, been sunk to the depth of about fifteen feet, on a vein of quartz and mispickel, was filled with water; but, from an examination of the immediately adjacent strata, the vein appears to me to be on the run of that from the Williams shaft. During the winter of 1870, about three hundred tons of ore from this mine were put through a small stamp-mill, which had formerly been in use at Eldorado, and I am informed that yields have been obtained, varying from $4.00 to $12.00 per ton.

The Gatling Mine

4. The *Gatling Mine*, the property of W. J. Gatling and partners is situated on the north-eastern corner of the ninth lot, in the eighth concession of Marmora. It is on a bedded vein, striking nearly north and south magnetic, and having a dip to the westward $< 30°$. The vein is composed largely of white translucent quartz and mispickel, with abundance of a very black mica, and has an average width of from seven to ten feet. On this lode, besides a number of small openings, two shafts have been sunk, No. 1, to the depth of sixty eight feet, and No. 2.—eighty feet distant from No. 1.—to the depth of sixty-four feet. Another shaft, No. 3, has been sunk on a parallel vein, three hundred feet west, to the depth of twenty feet. The foot-wall of both these veins is composed of a greyish-blue nacreous or talcose schist, similar to that accompanying the Gillen vein; it is intercalated with layers of quartz and sulphurets, through which gold is very frequently visible. The hanging-wall is a greenstone or diorite with disseminated pyrites. In making a section across the north-eastern quarter of this lot, there appeared to me to be evidence of at least three distinct and parallel ore-zones, within a distance of three hundred feet, in each of which gold had been found by Mr. Gatling and Mr. O'Neill. These zones are separated from one another by bands of greenstone, felsite and slate. Limestones do not occur in their immediate vicinity, but rather more to the westward, and a few hundred feet higher in the series.

Character of the vein.

Limestone.

From shafts Nos. 1, 2, 3, about two thousand tons of ore have been mined and raised, of which the greater part still lies on the ground awaiting treatment. From this pile, however, Mr. Gatling has sent to Mr. Balbeck & Brothers, of Newark, N. J., two barrels of samples, amounting to about 1700 lbs.—one lot, representing ore taken from the east, and the other from the west vein. By smelting, Mr. Balbeck obtained from the former about $28.00, and from the latter upwards of $30.00 per ton, $4.00 of which was in each case silver. Numerous beautiful shows of gold were found all along the course of the veins on this lot by both Mr. Gatling and Mr. O'Neill, who also panned out considerable quantities of gold from the decomposing ferruginous vein-stuff. Mr. Gatling has made many improvements on the property, having cleared over six acres, and erected a number of substantial and neat frame buildings in proximity to the shafts. Among these, are a dwelling-house, a boarding-house with accommodation for thirty workmen, a work-shop, stable, carriage-house, and smith's forge. A good road has also been constructed, connecting with the main travelled road from Madoc, to the village of Marmora. Preparations have already been commenced by Mr. Gatling for the erection of a twenty-stamp mill and suitable roasting furnace, and there is little doubt but that this mine will be in full working order within a very few months. Following on the strike of these bedded lodes in a northerly direction, we next come to the Hawk-eye Co.'s mine.

Yield of gold by smelting.

Improvements

The Hawk-eye Company's Mine.

5. The *Hawk-eye Co.'s* mine is situated on the east quarter of the tenth lot, in the eighth range, and less than one-quarter of a mile north of Mr. Gatling's mine. Here, gold occurs under conditions similar to those last described. Slate, greenstone and felsite bands are interstratified and accompanied with veins or beds of quartz and mispickel. Two shafts have been sunk on one of these veins by Mr. Jones of Iowa, one to the depth of forty-six feet, and another to thirty feet. From these openings a considerable amount of ore has been raised, but has not yet been milled. During my visit no work was in progress, but I was informed that operations were to be commenced early in the spring of 1872, on the return of the proprietors. Beyond this lot the gold-bearing zones are lost sight of, in the swamp already noted as covering the greater portions of the eleventh, twelfth, and the thirteenth lots, of the ninth range. Proceeding northward we next come to Neill's mine.

Neill's Mine.

6. *Neill's Mine* is situated on the west half of the fourteenth lot, in the tenth concession of Marmora. I discovered and traced out the vein on this lot in September, 1867, before any mining locations were being worked in Marmora. Specimens of quartz with mispickel, brought down at that time, and subsequently examined, yielded me by assay, in the laboratory of the Geological Survey Office, upwards of $5.00 to the ton. During the years 1870 and 1871, an opening was made on the vein by Mr.

Neill, the owner of the lot, but with what result, I have not been informed. The geological conditions of this deposit resemble those of the Williams vein, on the seventh lot of the ninth concession. It almost immediately borders on the great granite area existing to the eastward, but from which it is separated by a granitic and greenstone breccia, to which I have already referred. (Report of Progress for 1866-69, pages 146, 147.) There is little doubt but that mispickel zones or belts carrying gold will yet be discovered above the horizon of Neill's vein, on the eastern portion of the fourteenth lot in the ninth, and probably on the western portion of the fifteenth lot in the tenth concession, corresponding with the upper zones on the Gatling lot.

The Powell Mine.

7. The *Powell Mine* is situated about one mile and a-half N. N. E. from *Neill's* mine, being on the western portion of the seventeenth lot of the eleventh concession of Marmora, and more or less work has been done there since the year 1867. During the fall of 1866, while mapping the distribution of the ferriferous belt of rocks through Madoc, I succeeded in tracing a band of sulphurets—mispickel and iron pyrites—through this lot, and noted the occurrence of some deposits of magnetic iron-ore. (Report of Progress for 1866-69, page 151.) A shaft, now about fifty feet deep, has been sunk on a vein of quartz and mispickel, in greyish talcose slate, which strikes nearly due north and south, magnetic, and dips to the westward $< 25°—35°$. The vein is said to average about ten feet in width. A temporary stamp-mill with five stamps, worked by an engine of twenty horse-power, has been erected for testing the ore. The pulverized mineral s roasted in a small, ordinar reverberatory furnace, previous to its treatment in the mill. Mr. Jenkins, who is at present superintending the work informs me that the mill crushes about five tons in the twenty-four hours. The proprietors intend, however, should they meet with sufficient encouragement, to erect a mill of at least twenty stamps. Only a small quantity of surface ore has yet been operated on, but has yielded on an average about $5.00 to the ton. Some seven or eight men are at present employed on the location.

The table on the following page contains the results of assays made by Dr. B. J. Harrington, in the laboratory of the Geological Survey Office. The specimens were all collected by myself, with the exception of the ore from the Cooke or Williams mine, and the poorer of the tailings from the same place.

I have the honor to be,
Sir,
Your obedient servant,
HENRY G. VENNOR.

Geological Survey Office,
1st May, 1872.

ASSAYS BY DR. B. J. HARRINGTON.

In the foregoing Report nothing is said with regard to gold localities outside of Marmora; but a few specimens from the Townships of Levant and Elzevir having been examined at the same time as those from Marmora, it has been thought advisable to include the results in the following table. In most cases silver was absent, or, if present, occurred in such minute quantity as to be of no economic value :—

Names of Mines or of Proprietors.	Township, Lot and Range.	Character of Ore	Ounces of Gold per ton 2000 lbs	Value per ton. (2000 lbs.)	Remarks
Gillen Mine.....	Marmora, 6, 8.	Mispickel and quartz	4.90	$101 23	A vein worked at present.
" " ...	" "	Mispickel and quartz	0.6125	12 65	Not from the same vein as the above.
Gatling Mine...	" 9, 8.	"	3.736	77 18	Now being worked.
Williams & Co.	" 8, 9.	Ordinary and magnetic pyrites with chloritic matter.....	No trace of gold or silver.		Occurs in magnetic iron in the vicinity of the Marsh Ore Bed.
" ...	" "	Finely granular mispickel.....	"		This, like the last, was a surface specimen, no openings having been made.
Cooke or Williams' Mine.	" 7, 9.	Mispickel and vitreous quartz.....	4 14	85 53	Worked at present.
" " ...	" "	Concentrated tailings form Dr. Williams' Mill, chiefly quartz and mispickel.....	0.8458	17 47	Trials on a large scale are said to have yielded a much larger amount of gold; but the quantity of course varies according to the degree to which the tailings have been concentrated.
" " ...	" "	Similar to the last, but not so well concentrated.....	0.466	9 71	
Williams, Dean & Co.	" 20 5.	Mispickel with a little quartz.....	1.545	31 92	From a locality not yet described, and belonging apparently to a different horizon from any of the above.
B. Hutchins, Esq.....	Levant, 6, 7.	White quartz with chlorite and copper pyrites.....	No gold or silver.		Some years ago a few small openings were made on this and the following lots for copper.
" "	" 4 or 5, 7.	Fahlband.....	Trace of gold		
" "	" 8, 7.	Compact quartzose dolomite, holding sulphides of iron and copper.....	0.255	5 27	